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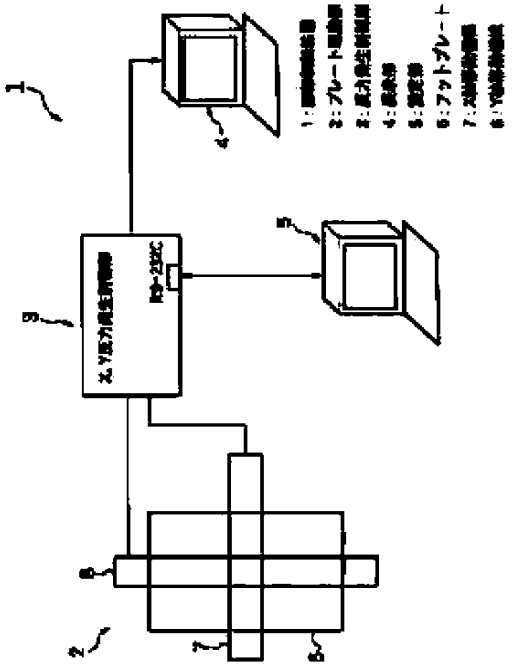
(54) LEG TRAINING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a leg training device to be used for both leg training for an aged person and the like, and leg muscle power reinforcing training for a non-handicapped person.

SOLUTION: The leg training device 1 is to train the leg by supporting and moving a trainee's leg. The device is equipped with a plate driving part 2 which moves a foot plate 6 supporting the trainee's leg forward, backward and to the right and left, a control part 3 for generating resilence controlling a load applied to the leg when the foot plate 6 is moving, display part 4 displaying various information during training, and a set-up part 5 executing various set-up accompanying the training. The plate driving part 2 is provided with an operating-force detecting function detecting the load applied to the leg, a position detecting function detecting the position of the foot plate 6, and a mouth function executing cursor movement and click. Servomotors 15, 25 control the load and positively move the foot plate 6 or suppress its movement.



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CLAIMS

[Claim(s)]
[Claim 1]In a leg training device which trains the leg by supporting and moving a trainer's leg, A leg training device which having had a plate actuator which moves a footplate supporting a trainer's leg to front and rear, right and left, and a reaction force generating control section which controls load which takes for a trainer's leg at the time of movement of the above-mentioned footplate, and constituting.
[Claim 2]The leg training device according to claim 1 which is provided with the following and characterized by controlling load which requires a reaction force generating control section for a trainer's leg by a detection value by these operation force detection function and a position detecting function.
An operation force detection function which detects load which requires the above-mentioned plate actuator for the leg via the above-mentioned footplate.
A position detecting function which detects a position of the above-mentioned footplate.

[Claim 3]The leg training device according to claim 1 or 2 which is provided with the following and characterized by making it function as a mouse.
A function in which the above-mentioned plate actuator changes movement of a footplate into movement of cursor.
A function to change that a footplate is stepped on into a click.

[Claim 4]A leg training device having controlled movement of a footplate of the above-mentioned plate actuator, and using a servo motor which adjusts load

concerning a trainer's leg in a leg training device given in any 1 clause of Claims 1-3.

[Claim 5]A leg training device applying load so that a reaction force generating control section may move the above-mentioned footplate to any 1 clause of Claims 1-4 positively to a weak trainer of strength of its legs in a leg training device of a description and movement of the above-mentioned footplate may be suppressed to a strong trainer of strength of its legs.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention is used for functional recovery training of the person to whom functions of the leg, such as elderly people, an inpatient, and a physically handicapped person (henceforth "elderly people etc."), fell, and the muscle strengthening exercise of a healthy person's leg, and relates to a suitable leg training device.
[0002]
[Description of the Prior Art]Generally, since elderly people are not so active, it tends to become lack of exercise and strength of its legs also tends to decline. It is not few, also when physical strength declines quickly taking advantage of illness or an injury, strength of its legs also declines and it becomes bedridden.
[0003]In this case, functional recovery training is performed by the training machine etc. which were designed according to elderly people's etc. physical strength. There are equipment which supports the bodies, such as elderly people, and helps a walk while moving together in order to specifically recover strength of its legs by walking, equipment which performs walking training while it is installed on the locus of a walk like a handrail, elderly people etc. hold by hand and the body is supported, etc.
[0004]
[Problem to be solved by the invention]However, in the above-mentioned conventional equipment, training is not materialized without volition, such as elderly people who are going to do walking training. That is, when losing most volition along which elderly people etc. walk and having bent, there is a problem

that it is difficult to train, in the above equipment.

[0005]This invention was made in view of such a problem, and an object of this invention is for the elderly people who lost most volition of training to be also able to train comfortably, and to provide the leg training device which can be used also for the muscle strengthening exercise of a healthy person's leg.

[0006]

[Means for solving problem]In the leg training device which trains the leg by the leg training device concerning the 1st invention supporting a trainer's leg, and moving, It had the plate actuator which moves the footplate supporting a trainer's leg to front and rear, right and left, and the reaction force generating control section which controls the load which takes for a trainer's leg at the time of movement of the above-mentioned footplate, and was constituted.

[0007]By the above-mentioned composition, a trainer puts one leg on the footplate of a plate actuator. In this state, a footplate supports a trainer's one leg and moves to front and rear, right and left. A reaction force generating control section controls the load which takes for a trainer's leg at the time of movement of a footplate according to healthy persons, such as elderly people.

[0008]In the leg training device which the leg training device concerning the 2nd invention requires for the 1st invention, The operation force detection function which detects the load which requires the above-mentioned plate actuator for the leg via the above-mentioned footplate, It has a position detecting function which detects the position of the above-mentioned footplate, and a reaction force generating control section controls the load concerning a trainer's leg by the detection value by these operation force detection function and a position detecting function.

[0009]The above-mentioned composition detects the position of the power which requires an operation force detection function and a position detecting function for a footplate, and a footplate. The load etc. which have been indirectly applied to a trainer's leg by this are known, and a reaction force generating control section controls load suitably according to it.

[0010]In the leg training device which the leg training device concerning the 3rd invention requires for the 1st or 2nd invention, The above-mentioned plate actuator is provided with the function to change movement of a footplate into movement of cursor, and the function to change that a footplate is stepped on into a click, and it is made to function as a mouse.

[0011]By the above-mentioned composition, if the footplate of a plate actuator is

moved, the cursor on a display will move according to movement of a footplate. thereby, a footplate is stepped on after moving cursor to a specified position -- it is crowded and clicks. Thereby, with the easy posture which sat on the chair, the trainer to whom strength of his legs fell can also perform required setting out etc., and can train easily.

[0012]In the leg training device concerning either the 1st thru/or the 3rd invention, the leg training device concerning the 4th invention controlled movement of the footplate of the above-mentioned plate actuator, and the servo motor which adjusts the load concerning a trainer's leg was used.

[0013]The current of a servo motor, etc. can be changed suitably and the load concerning a trainer's leg can be easily adjusted with the above-mentioned composition.

[0014]In the leg training device which the leg training device concerning the 5th invention requires for either the 1st thru/or the 4th invention, A reaction force generating control section moves the above-mentioned footplate positively to the weak trainer of strength of its legs, and load is applied so that movement of the above-mentioned footplate may be suppressed to the strong trainer of strength of its legs.

[0015]The leg can be trained only by the elderly people to whom strength of their legs fell extremely putting one leg on a footplate by the above-mentioned composition. Also in the healthy person who wants to perform muscle training, it can train efficiently by moving the footplate which load required.

[0016]

[Mode for carrying out the invention]Hereafter, the leg training device concerning this invention is explained, referring to an accompanying drawing. The side view in which the outline block diagram showing the leg training device which drawing 1 requires for this embodiment, the perspective view showing the plate actuator of the leg training device which drawing 2 requires for this embodiment in the state except the footplate, and drawing 3 show the A-A arrowed cross-section of drawing 2, and drawing 4 shows a training state, and drawing 5 are the top views showing a training state.

[0017]The leg training device 1 concerning this embodiment sets it as one purpose to prevent increase of the patient of a bedridden state. That is, it is equipment contributed to prevention of the generating about bedridden [resulting from the slight diseases or short term hospital admission instead of a critical disease or an obstacle, such as cerebral apoplexy]. The control action system

considered that this leg training device 1 has an effect in the maintenance of a motor function including a cranial nerve system instead of muscular power training of the intensity where a burden is placed on the heart etc. is trained. Like the sport player, the leg training device 1 is a healthy person, and also makes it the purpose to enable it to use it to reinforce the muscular power of the leg.

[0018]This leg training device 1 mainly comprises the plate actuator 2, the reaction force generating control section 3, the display 4, and the set part 5, as shown in drawing 1.

[0019]The plate actuator 2 is equipment for elderly people, etc. a sport player (henceforth a "trainer"), etc. to put a leg directly, and perform training of a control action system, and training of muscular power strengthening. This plate actuator 2 mainly comprises the footplate 6, the X shaft movement mechanism 7, the Y shaft movement mechanism 8, and a Z axial-tension detection means (not shown), as shown in drawing 1, and 2 and 3.

[0020]The footplate 6 is a plate for putting the leg of the side which a trainer trains. As for the size of this footplate 6, at about 300x150 mm, the height from a floor line is set as less than 100 mm. The thin rubber plate for skids is stuck on the surface of the footplate 6. The cushion for impingement protections is formed in the periphery of the footplate 6. A means (not shown) to fix the legs, such as a foot belt, if needed is formed. Especially when a healthy person performs muscle training, it is desirable to establish fixing means, such as a foot belt which can fix a foot in simple. Other portions, such as a size of the footplate 6, are suitably set up fully in consideration of the purpose of use, safety, etc. The nut section 6A thrust into the drive rod 24 of Y shaft movement mechanism 8 mentioned later is formed in the lower surface of this footplate 6.

[0021]It is set up carry out a scram, when the emergency stop switch (not shown) using a spring etc. is formed in the footplate 6 and it moves to it across a setting range for the safety reservation to a periphery. Thereby, the footplate 6 grade has canceled the fault of contacting a trainer's foot at the time of movement of the footplate 6.

[0022]X shaft movement mechanism 7 is a means for making it move to an X axial direction in support of the footplate 6 via Y shaft movement mechanism 8. This X shaft movement mechanism 7 comprises the plinth 9, the two guide rails 10 and 11, the support plate parts 12 and 13 of two sheets, the drive rod 14, and the servo motor 15.

[0023]The plinth 9 is a substrate which supports the guide rails 10 and 11 and the

support plate parts 12 and 13. Each guide rails 10 and 11 are allocated in parallel on the plinth 9, and the support plate parts 12 and 13 are allocated in the both ends. The two sliders 16 and 17 are formed at a time on each guide rail 10 and 11. These four sliders 16 and 17 are attached to the bottom of Y shaft movement mechanism 8, and to the X axial direction, are supporting Y shaft movement mechanism 8 so that reciprocation moving is possible. The drive rod 14 is allocated in parallel with each guide rails 10 and 11, and the both ends are supported pivotable by the support plate parts 12 and 13 of two sheets. The screw thread is provided in the surface of the drive rod 14. The nut section 18 by the side of Y shaft movement mechanism 8 later mentioned to this drive rod 14 is thrust, and exact movement of the Y shaft movement mechanism 8 is carried out by rotating the drive rod 14 in an X axial direction. The servo motor 15 is attached to one support plate part 12. The servo motor 15 is connected with the drive rod 14, and the drive rod 14 is rotated with the revolving speed, the torque, and the rotation (number of rotations) which were set up. As for the servo motor 15, the revolving speed, torque, and a rotation are controlled by the reaction force generating control section 3. Revolving speed is set [sec] up in a maximum of 100 mm /with the movement speed of the footplate 6. Generating torque is set as a maximum of 3 kg.

[0024]X shaft movement mechanism 7 is equipped with an operation force detection function and a position detecting function. An operation force detection function is a function for detecting power which the footplate 6 received with power of a trainer's leg. Power which this footplate 6 received serves as load concerning a trainer's leg. It is twisted between the drive rod 14 and the servo motor 15, a sensor may be formed and it may be made to make a processing capability computed from change of current of the servo motor 15, etc. realize, and to realize, and an operation force detection function may provide a piezoelectric device between the servo motor 15 and the support plate part 12, and may be realized.

[0025]Here, an operation force detection function computed from change of current of the servo motor 15, etc. is used. The servo motor 15 is controlled by the reaction force generating control section 3, and current etc. are adjusted. That is, revolving speed and a rotation of the servo motor 15 are always detected, and current etc. are adjusted so that they may become a preset value. And current shows a specific value according to revolving speed etc., if there is no load concerning the servo motor 15. When load is applied to the servo motor 15,

values, such as current, are also changed according to the load. For this reason, relation between a size of load and variation, such as current, is measured beforehand, load applied to the servo motor 15 under operation in comparison with it is detected, and power of an X axial direction concerning the footplate 6 is computed. A detection range of power concerning this footplate 6 is set as -5 - +5kgf. It is set as detecting accuracy of 50g or less. Below hysteresis**1.0%FS, below **1.0% of nonlinear FS, and below **2% of degree FS/FS of interference are set as **0.05%/** or less of temperature influence of an output. A load value is a size concerning the footplate 6, and can be set up now by 50gf unit to 0.05 - 5kgf. When a load set value is the minimum, movement speed of the footplate 6 is set to s in 100 mm /.

[0026]Detection of the rotation of the servo motor 15 has realized the position detecting function. The rotation is a rotation of the drive rod 14, and the servo motor 15 can compute the exact movement magnitude to the X axial direction of the footplate 6 by applying the pitch of the screw of the drive rod 14 to this, although the rotation is always detected. This position detecting function has achieved X axial movement function (function for which cursor is moved to a transverse direction on the display 4) of the mouse of a computer. That is, if the footplate 6 is moved to an X axial direction, the movement magnitude of an X axial direction will be detected by a position detecting function, and the cursor on the display 4 will move only the direction and distance corresponding to the movement magnitude to a transverse direction. X shaft movement mechanism 7 is set as a length of not less than 200 mm, and can move the footplate 6 now to an X axial direction not less than 200 mm. And the detection range (moving range of the footplate 6) of the X axial direction of the footplate 6 in a position detecting function is set as **100 mm from the central point of the plinth 9 to X axial direction right and left. A detection range may be made longer than **100 mm. According to usage etc., it is set up suitably. Detection power is set as 0.2 mm or less.

[0027]Y shaft movement mechanism 8 is a means for making it move to Y shaft orientations in support of the footplate 6. This Y shaft movement mechanism 8 comprises the nut section 18, the plinth 19, the two guide rails 20 and 21, the support plate parts 22 and 23 of two sheets, the drive rod 24, and the servo motor 25.

[0028]The nut section 18 is a component for Y shaft movement mechanism 8 to be moved by rotation of the drive rod 14 of X shaft movement mechanism 7 to an

X axial direction. This nut section 18 is attached to the rear face of the plinth 19, and is thrust into the drive rod 14 of X shaft movement mechanism 7. Thereby, if the drive rod 14 rotates, the nut section 18 will be moved to the shaft orientations of the drive rod 14, and Y shaft movement mechanism 8 will be correctly moved to an X axial direction.

[0029]The plinth 19 is a substrate which supports the guide rails 20 and 21 and the support plate parts 22 and 23. It is fixed to the four sliders 16 and 17 laid in each guide rails 10 and 11 of X shaft movement mechanism 7, and this plinth 19 is supported by the X axial direction so that a slide is possible. Each guide rails 20 and 21 are allocated in parallel on the plinth 19, and the support plate parts 22 and 23 are allocated in the both ends. The two sliders 26 and 27 are formed at a time on each guide rail 20 and 21. These four sliders 26 and 27 are attached to the bottom of the footplate 6, and to Y shaft orientations, are supporting the footplate 6 so that a slide is possible. The drive rod 24 is allocated in parallel with each guide rails 20 and 21, and the both ends are supported pivotable by the support plate parts 22 and 23 of two sheets. The screw thread is provided in the surface of the drive rod 24. The nut section 6A of the footplate 6 is thrust into this drive rod 24, and the footplate 6 is moved to Y shaft orientations by rotating the drive rod 24. The servo motor 25 is attached to one support plate part 22. The servo motor 25 is connected with the drive rod 24, and the drive rod 24 is rotated with the revolving speed, the torque, and the rotation which were set up. As for the servo motor 25, the revolving speed, torque, and a rotation are controlled by the reaction force generating control section 3. Revolving speed is set [sec] up in a maximum of 100 mm /with the movement speed of the footplate 6. Generating torque is set as a maximum of 3 kg. A load value can be set up now by 50gf unit to 0.05 - 5kgf in the size concerning the footplate 6. When a load set value is the minimum, movement speed of the footplate 6 is set to s in 100 mm /.

[0030]Y shaft movement mechanism 8 is equipped with the same operation force detection function and position detecting function as the above-mentioned X shaft movement mechanism 7. Y axial movement function (function to move cursor to a lengthwise direction on the display 4) of a mouse is achieved, and if the footplate 6 is moved to Y shaft orientations, as for this position detecting function, the cursor on the display 4 will move to a lengthwise direction. Y shaft movement mechanism 8 is set as a length of not less than 200 mm, and the detection range of Y shaft orientations of the footplate 6 in a position detecting function is set as **100 mm before and behind Y shaft orientations from the central point of the

plinth 9. A detection range may be made longer than **100 mm. According to usage etc., it is set up suitably. Detection power is set as 0.2 mm or less. The detection range of the power concerning this footplate 6 is set as -5 - +5kgf. It is set as the detecting accuracy of 50g or less. Below hysteresis**1.0%FS, below **1.0% of nonlinear FS, and below **2% of degree FS/FS of interference are set as **0.05%/** or less of the temperature influence of an output.

[0031]Between the footplate 6 and the sliders 26 and 27, a Z axial-tension detection means (not shown) to detect the load of Z shaft orientations is formed. This Z axial-tension detection means is constituted by the piezoelectric device which detects load in case a trainer breaks in the footplate 6 strongly on one leg as the change of potential. The detection range of the power concerning the footplate 6 is set as 0 - +5kgf. It is set as the detecting accuracy of 50g or less.

[0032]This Z axial-tension detection means has realized a function of a mouse conjointly with X shaft movement mechanism 7 and Y shaft movement mechanism 8. Voltage as a detection value in Z axial-tension detection means is inputted into the reaction force generating control section 3, is compared with a threshold beforehand set up by this reaction force generating control section 3, and when a threshold is exceeded, it is changed into a click signal. Namely, the trainer can perform [operation of membrum inferius] now an input by a mouse to a computer usually performed by hand in the state of a seating position by making it move to arbitrary positions and breaking in the footplate 6 strongly. As a maximum of 2 seconds, an interclick interval at the time of a double click is set up so that it can adjust at intervals of 0.2 second. Even when elderly people etc. train a muscle regulatory system, it has come to be able to perform smooth operation thereby.

[0033]The reaction force generating control section 3 is equipment which controls the plate actuator 2. It is controlling the servo motor 15 of X shaft movement mechanism 7, and the servo motor 25 of Y shaft movement mechanism 8, and specifically giving reaction force to the footplate 6, Load is applied to a trainer's leg, and a detection value from X shaft movement mechanism 7, Y shaft movement mechanism 8, and Z axial-tension detection means is processed, and a mouse signal is outputted to the display 4.

[0034]Control to the servo motors 15 and 25 is performed by changing current etc. By changing current etc., revolving speed and torque of the servo motors 15 and 25 change, and load applied to a trainer's leg via the footplate 6 is adjusted. A protection circuit is provided in order to keep an over-current from flowing into the

servo motors 15 and 25 at this time. As control of the footplate 6 by the servo motors 15 and 25, there are a size of the move direction, movement speed, movement magnitude, and load, etc. Revolving speed of each servo motors 15 and 25, etc. are adjusted by the reaction force generating control section 3, and the move direction of the footplate 6, movement speed, movement magnitude, etc. are adjusted. A size of load applied to a trainer's leg via the footplate 6 by adjusting current etc. and fluctuating torque of each servo motors 15 and 25 is adjusted.

[0035]Two or more patterns are set up as how to apply load to this trainer's leg. A pattern of how to specifically apply load performed to training of control action systems, such as elderly people, and how to apply load performed to training of a healthy person's muscular power strengthening is stored. Two or more patterns are stored in each of these two training according to a trainer's grade. For example, a pattern strengthened as load is weakened in the center section and it moves to a position of right and left ends, Many patterns of enlarging load in a position corresponding to form of the reverse pattern and the leg most using muscles to stimulate, or changing load finely are stored in the reaction force generating control section 3 as a map. A reference value is changed by pattern used for training of a control action system, and a pattern used for training of a healthy person's muscular power strengthening. That is, in the case of elderly people etc., ****** and load which lengthen a reference value are made small. Movement speed and movement magnitude of the footplate 6 are also set up small, and speed is kept from coming out not much. Enough in consideration of safety, a motion of the footplate 6 is made loose so that there may be no danger to elderly people etc. That is, the footplate 6 begins to move gently and stops gently. When strength of its legs is declining extremely, the footplate 6 is moved by X shaft movement mechanism 7 and Y shaft movement mechanism 8, and it may be made to move the leg compulsorily.

[0036]The direction which applies load may be applied to the case where it applies in brake, and a central direction. That is, when the footplate 6 moves in the arbitrary directions in arbitrary positions, the brake load of the size set up only during the movement may be applied to a central direction so that the footplate 6 may always return to a center position with the case where it starts in the direction which suppresses movement of the footplate 6. It is set up become no-load when the footplate 6 stops.

[0037]In the case of a healthy person, a reference value is made high, and it

enlarges load. A trainer can choose now the size of these patterns and load arbitrarily by the set part 5. The load value concerning the footplate 6 makes a maximum the set-up value, and when becoming that a preset value is likely to be exceeded during training, the current of the servo motors 15 and 25, etc. are adjusted so that the preset value may not be exceeded.

[0038]The display 4 is equipment for displaying various kinds of information in the case of training. While moving the footplate 6 by the leg especially, movement of the footplate 6 is displayed. It is connected to the reaction force generating control section 3, and the display 4 receives the signal of the mouse by the plate actuator 2. According to setting out, cursor is moved according to the procedure of training on the display 4. The display 4 is equipped with the function which can do the calibration of a three-point system so that the correspondence relation of the detection range of a position signal and computer screen range by the position detecting function of X shaft movement mechanism 7 and Y shaft movement mechanism 8 can set up arbitrarily. That is, by moving the footplate 6 to three arbitrary places, and breaking in and clicking the footplate 6 there, it sets up so that it may be equivalent to the upper left on the computer screen range, the upper right, and the lower right.

[0039]The set part 5 is equipment for setting up torque, a moving range, movement speed, etc. according to a trainer's liking. It is connected to the reaction force generating control section 3, and the set part 5 can set up torque etc. now finely according to the grade of training. Setting methods in the set part 5 include the method of inputting from a keyboard, and the method of using the plate actuator 2 which functions as a mouse. When using the plate actuator 2, an icon is clicked on it and set up, moving cursor on the display 4.

[0040][Operation] -- the leg training device 1 constituted as mentioned above is used as follows.

[0041]A trainer puts one leg on the footplate 6 of the plate actuator 2 in the state where sat on the chair and it relaxed, as shown in drawing 4 and 5. Since it is no-load when having stopped, the footplate 6 can be moved easily. By this, the footplate 6 is moved slowly, cursor is moved by the display 4, and required setting out of consistency etc. to the size of load, a training pattern, a screen, and the moving range of the footplate 6 is performed by breaking in and clicking the footplate 6. It may set up by a keyboard from the set part 5.

[0042]Where one leg is relaxedly put on the footplate 6, initial load (dead load) of membrum inferius is canceled, and the state is set as load of 0 kg. A load variation

from this state to the direction of plus or minus is outputted as power.
[0043]Sat on a chair, a trainer puts power into a leg and moves the footplate 6 to it. When a procedure of training is displayed on the display 4 at this time, the footplate 6 is moved so that cursor may move according to that procedure.
[0044]If the footplate 6 is moved by trainer, a size of load applied to the leg by an operation force detection function and a position detecting function of X shaft movement mechanism 7 and Y shaft movement mechanism 8 and movement magnitude of the footplate 6 will be detected, It is displayed on the display 4 with movement magnitude of a numerical value, a graph, and cursor, etc., and is recorded on the set part 5.
[0045]In X shaft movement mechanism 7 and Y shaft movement mechanism 8, the servo motor 15 and the servo motor 25 which were controlled by the reaction force generating control section 3 change revolving speed, torque, etc. finely according to a pattern of set-up training. Thereby, the footplate 6 moves according to elderly people etc. and a healthy person.
[0046]In the case of elderly people etc. who are falling extremely, strength of its legs moves the footplate 6 gently with X shaft movement mechanism 7 and Y shaft movement mechanism 8 in the state where sat on a chair in the easy state and one leg is put on the footplate 6. Thereby, even if elderly people do not put power into a leg, they can move a leg.
[0047]In the case of the healthy person who performs muscle training, the load of the footplate 6 and the full limits of movement speed are set up suitably, and it uses muscles efficiently.
[0048][Effect] -- with the leg training device 1 of this embodiment as mentioned above. Since a trainer puts one leg on the footplate 6 of the plate actuator 2 in the easy state where it sat on the chair and it enabled it to use the muscles of a leg according to a motion of the footplate 6, the elderly people to whom strength of their legs fell extremely can also train the safe and effective leg easily.
[0049]Since it enabled it to adjust suitably the size of the load concerning the footplate 6, movement speed, etc., also in the healthy person who performs muscle training, it can train efficiently.
[0050]Since the reaction force generating control section 3 controls the load concerning a trainer's leg by the detection value by the operation force detection function and a position detecting function, the load of the optimal size can be applied according to a trainer's strength of its legs.
[0051]Since the plate actuator 2 functions as a mouse, various setting out for

training can be easily performed with the easy posture which sat on the chair.
[0052]Since the servo motors 15 and 25 were used for X shaft movement mechanism 7 and Y shaft movement mechanism 8, the load concerning a trainer's leg can be adjusted easily and certainly by controlling the current of these servo motors 15 and 25, etc.
[0053]The reaction force generating control section 3 can train the leg easily only by the elderly people who fell extremely [strength of its legs] putting one leg on a footplate by making it a trainer move the footplate 6 positively, where one leg is put. The leg can be efficiently trained also to elderly people etc. who do not have the volition to train.
[0054]Muscle training etc. can be efficiently trained by applying load so that movement of the footplate 6 may be suppressed to the strong trainer of strength of its legs.
[0055][Modification(s)]
(1) Although a Z axial-tension detection means to detect load was formed as a mechanism of Z shaft orientations, etc. in the above-mentioned embodiment, X shaft movement mechanism 7 and Y shaft movement mechanism 8, and same Z shaft movement mechanism are formed, and it may enable it to go up and down the footplate 6 to a sliding direction. The height of the footplate 6 can be adjusted and it can double with various conditions, such as a difference in a trainer's extension.
[0056]The angle-of-gradient regulating function of the footplate 6 is provided, and it may be made to adjust the inclination of the footplate 6 according to the angle of an ankle. In this case, for example, it is made to incline so that the tiptoe side may be raised. An angle of gradient shall be less than 10 degrees from the level. It becomes equipment this is easy to use also for a person with a hard ankle.
[0057](2) Although the above-mentioned embodiment explained an example which uses the leg training device 1 for training of the leg, the leg training device 1 can be used besides the leg. For example, the waist can be put on the footplate 6 and it can use for training to which the waist is moved. It may be used for training to which the body is moved in the state where he has slept. For example, the leg training device 1 is put on three or more places two places again at the waist, a leg and the back, the waist, etc., and it may be made to move so that the body may be crooked.
[0058]
[Effect of the Invention]As mentioned above, according to this invention, the

following effects are done so as explained in full detail.

[0059](1) Since a trainer puts one leg on the footplate of a plate actuator in the easy state where it sat on the chair and it enabled it to use the muscles of a leg according to a motion of a footplate, the elderly people to whom strength of their legs fell extremely can also train the safe and effective leg easily.

[0060](2) Since it enabled it to adjust the size of the load concerning a footplate, movement speed, etc. suitably, also in the healthy person who performs muscle training, it can train efficiently.

[0061](3) Since the load concerning a trainer's leg was suitably controlled by the reaction force generating control section, the load of the optimal size can be applied according to a trainer's strength of its legs.

[0062](4) Since a plate actuator functions as a mouse, various setting out for training can be easily performed with the easy posture which sat on the chair. In this case, it is ideal for the elderly people etc. to whom strength of their legs fell especially training alone.

[0063](5) Since the footplate of the plate actuator was moved with the servo motor, the load concerning a trainer's leg can be adjusted easily and certainly by controlling the current of this servo motor, etc.

[0064](6) The leg can be easily trained only by the elderly people to whom strength of their legs fell extremely putting one leg on a footplate by a reaction force generating control section by making it a trainer move a footplate positively, where one leg is put. In this case, the leg can be efficiently trained also to elderly people etc. who do not have the volition to train.

[0065]Muscle training etc. can be efficiently trained now by applying load so that movement of a footplate may be suppressed to the strong trainer of strength of its legs.

[Translation done.]

* NOTICES *

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1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is an outline block diagram showing the leg training device concerning the embodiment of this invention.
[Drawing 2]It is a perspective view showing the plate actuator of the leg training device concerning the embodiment of this invention in the state except the footplate.
[Drawing 3]It is an A-A arrowed cross-section of drawing 2.
[Drawing 4]It is a side view showing the training state in the leg training device concerning the embodiment of this invention.
[Drawing 5]It is a top view showing the training state in the leg training device concerning the embodiment of this invention.
[Explanations of letters or numerals]
A leg training device, 2:plate actuator, 3:reaction force generating control section, 4 : 1: A display, A set part, 6 : 5: A footplate, a 7:X shaft movement mechanism, an 8:Y shaft movement mechanism, A plinth, 10, 11:guide rail, 12, 13:support plate part, 14 : 9: A drive rod, 15: A servo motor, 16, 17:slider, 18:nut section, 19:plinth, 20, 21:guide rail, 22, 23:support plate part, 24:drive rod, 25:servo motor, 26, 27 : slider.

[Translation done.]

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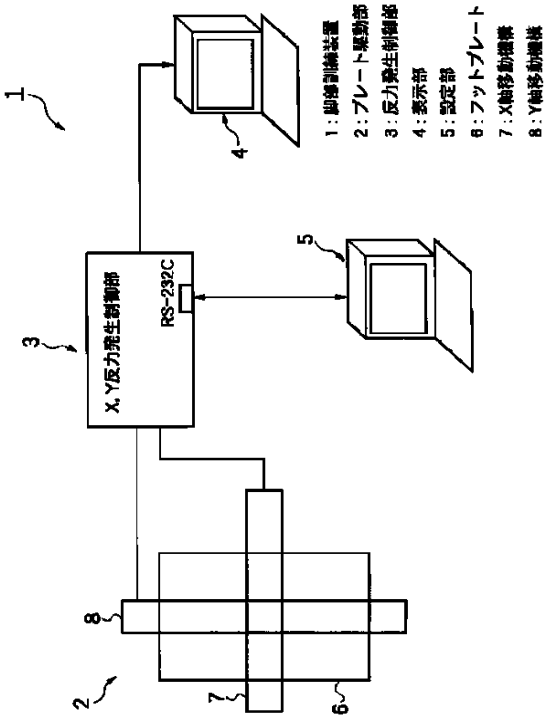
(54)【発明の名称】　脚部訓練装置

(57)



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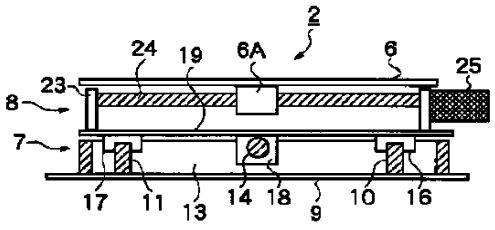

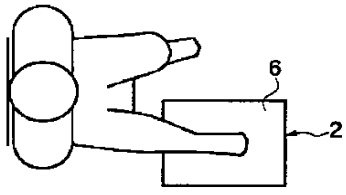

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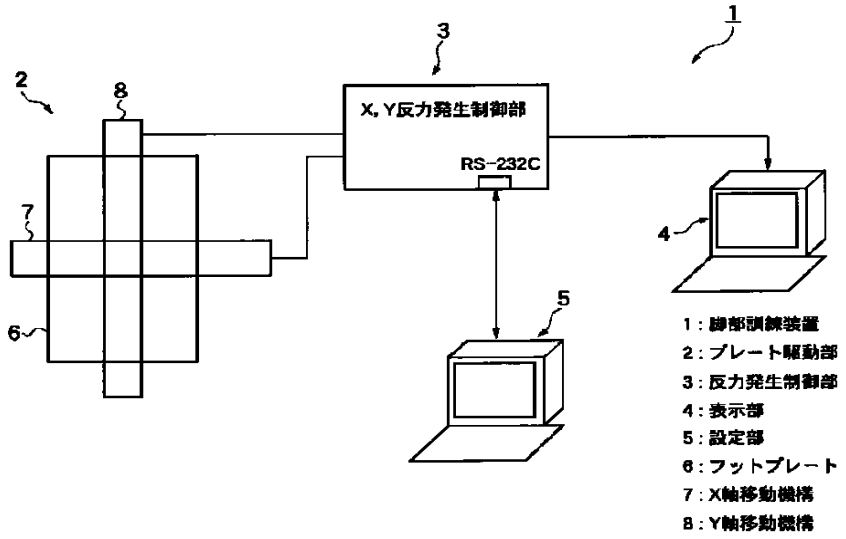
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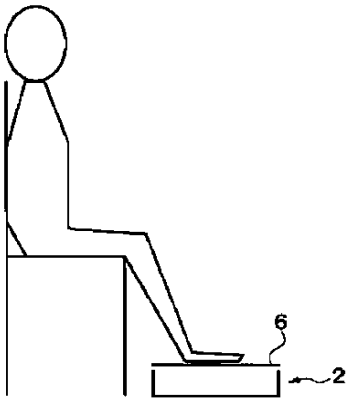
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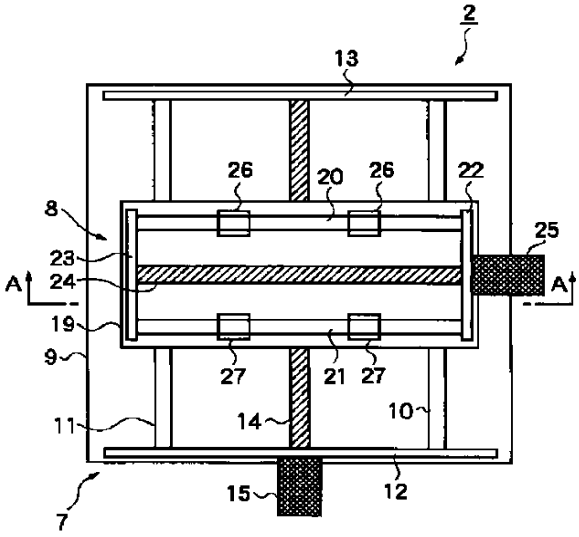
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